IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant: James Larry Jones

Serial No.: 09/862,910

I.Filed: May 22, 2001

Group Art Unit: 3743

Examiner: Leonard R. Leo

Title: Tube Type Heat Exchanger With Motor Or Generator Housing

Box AF
Commissioner of Patents & Trademarks
Washington, D.C. 20231

Dear Sir:

APPEAL BRIEF

This Appeal Brief is being filed following a Notice of Appeal mailed January 16, 2003 (received by the USPTO on September 10, 2002) in response to a Final Action mailed June 4, 2002 (paper no. 4). An appeal brief fee in the amount of $320.00 may be charged to Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds.

REAL PARTY IN INTEREST

The real party in interest is Sundyne Corporation of Arvada, Colorado. Sundyne Corporation is the Assignee of all right and title in this Application from the inventors, as indicated in the assignment recorded on May 22, 2001 at reel/frame 011847/0346.

CERTIFICATE OF MAIL

I hereby certify that the enclosed **Appeal Brief (in triplicate)** is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to Assistant Commissioner of Patents, Washington D.C. 20231 on March 24, 2003.

Lesley Upton
Lesley Upton

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 7, 9, 10, and 13 are presently pending in the application. Claims 7, 9, 10, and 13 stand finally rejected under §103(a). The rejection of claims 7, 9, 10, and 13 is being appealed.

STATUS OF AMENDMENTS

An Amendment After Final was filed on December 9, 2002 amending claim 13. The Advisory Action mailed December 30, 2002 indicated that the amendment had been entered for the purpose of appeal.

SUMMARY OF THE INVENTION

Referring to page 1 of the Specification, generators are utilized to convert rotary motion to electricity. Electric motors are utilized to produce rotary motion in response to electricity. Both generators and electric motors produce heat that may rise to an undesirable level. As a result, a cooling device may be required to reduce the heat generated by the electric motor or generator. A typical cooling device incorporates a fluid conduit or chamber for carrying fluid to an area near the motor or generator to absorb heat and reduce the temperature of the electrical mechanical device.

In aerospace applications, customers prefer that the cooling fluid come into contact with stainless steel only to minimize the impact of the corrosive effects of the cooling fluid. A prior art device shown in Figure 1, depicts an electromechanical device 10 such as an electric motor or generator. The electromechanical device includes a housing 12. A cooling

chamber 14 is formed by securing an external wall 13 to the housing 12. The housing 12 may be relatively thick to provide structural integrity to the device 10. The external wall 13 may be rather large to cover much of the housing 12. In conformance with customer expectations, the housing 12 and external wall 13 must be constructed from stainless steel. As a result, large portions of the electromechanical device 10 must be constructed from stainless steel thereby adding significant cost to the motor or generator. Therefore, what is needed is an improved cooling device for electric motors and generators that minimizes the use of stainless steel while still providing effective cooling.

Referring to page 3 of the Specification an electromechanical assembly 10, such as an electric motor or generator, is shown in Figure 2. The assembly 10 includes a housing 12 having a wall portion 16 and opposing end portions 18 secured to the wall portion 16. Preferably, the wall portion 16 is cylindrical in shape. A shaft 20 is supported by the end portions 18 for rotation relative to the housing 12. The shaft 20 includes wire windings 22. A magnetic field member 24 is arranged about the shaft 20 and windings 22 within the housing 12 and preferably, adjacent to the wall portions 16.

The electromechanical assembly 10 may be either an electric motor or a generator. In the case of an electric motor, the magnetic field member 24 is a stator that carries the current which produces a magnetic field. The windings 22 and shaft 20 form a rotor which rotates in response to the magnetic field produced by the stator. In the case of a generator, the shaft 20 is rotationally driven by an external drive. They windings 22 have current flowing therethrough, which produces a magnetic field that generates a current in the magnetic field member 24 thereby producing electricity.

One embodiment of the cooling device is shown in Figure 2. The cooling device includes a tube, preferably in the shape of a helical cooling coil 26, which has an inlet 28 and an

outlet 30. A pump 32 is fluidly connected to the inlet 28 and outlet 34 pumping fluid through the helical coil for absorbing heat produced by the electromechanical device 10. As shown in Figure 2, the helical coil 26 may be secured to a thin shell 34 that is arranged between the end portions 18 and spaced from the magnetic field member 24. In conformance with industry preferences, the helical coil 26 is preferably constructed from stainless steel. However, it is to be understood that the helical coil 26 may be constructed for many other suitable material that is compatible with the cooling fluid.

Referring to page 4 of the Specification, in another embodiment shown in Figure 3A, the wall portion 16 may be arranged immediately adjacent to the magnetic field member 24. The helical coils 26 may be secured to the wall portion 16 there by eliminating the thin shell 34. In yet another embodiment shown in Figure 3B, the helical coils 26 may be arranged immediately adjacent to the magnetic field generator 24 and in proximity to the wall portion 16. In the embodiments shown in Figures 2, 3A and 3B, the cooling coils 26 may be brazed to the wall portion 16, magnetic field generator 24, or thin shell 34. Of course the helical coils 26 may be supported relative to the housing 12 in any other suitable manner.

By utilizing the helical coils of the present invention, the large stainless steel housing and external wall of the prior art may be eliminated thereby reducing the overall cost of the electromechanical device.

ISSUES

I. Are the rejections of claims 7, 9, and 10 proper under §103 when the Examiner fails to provide a motivation?

II. Is the rejection of claim 13 proper when the references fail to disclose brazing as required by the claim?

GROUPING OF CLAIMS

The term "contested" means that Appellant is appealing the rejection provided by the Examiner to the particular claim or claims. The claims are grouped together by letter, and the claims within a particular group stand or fall together. However, the claims of one group do not stand or fall with the claims of another group.

A. The rejections of claims 7, 9, and 10 are contested.

B. The rejection of claim 13 is separately contested.

ARGUMENTS

I. The references fail to provide a motivation to modify the Admitted Prior Art

The rejections to claims 7, 9, 10, and 13 under §103 all rely upon the combination of the admitted prior art (APA) and Litton, which may not be properly combined. There is no suggestion or motivation for one of ordinary skill in the art to modify APA with what is taught in Litton. The fact that the references each generally deal with cooling is not sufficient to satisfy this requirement. The problem in APA is that a large portion of the electromechanical device, including structural members, must be constructed from stainless steel where in contact with cooling medium, which is very expensive. Specifically, the housing 12 is thick and runs the length of the device 10 to provide structural support. The external wall 13 also runs the length of the device 10. Accordingly, the problem identified in the APA is the large amount of stainless steel. The APA is not in need of improved heat transfer, but instead less stainless steel.

Litton is directed to improved cooling of a vacuum tube anode to maintain the liquid state of the cooling medium. To accomplish this, Litton discloses the use of a combination of three cooling means: 1) fins, 2) a cooling tube around the fins, and 3) spraying water over the fins. That is, Litton discloses cooling arrangements to supplement existing cooling. The

Examiner fails to present an argument as to why one of ordinary skilled in the art would modify APA with Litton in the face of their unrelated problems and purposes. The APA does not need supplemental cooling or even improved cooling. "Improved heat transfer", which is the motivation argued by the Examiner to modify the APA, is an insufficient motivation for making the specific modification needed because it is not apparent to one of ordinary skill how the amount of stainless steel from APA could be reduced by adding additional cooling elements. Accordingly, the pending claims are allowable.

II. The references does not disclose brazing

Claim 13 is allowable for the additional reason that a brazed joint is not disclosed in the references. How can claim 13 be obvious when one of its elements is missing from the references. Schade only discloses soldering, which is not brazing nor is it equivalent. Solder and braze do not consist of the same materials, nor are joining methods that may be interchanged with one another (see attached "Manufacturing Engineering and Technology" pages). The Examiner has erroneously used the terms interchangeably.

CLOSING

For the reasons set forth above, the final rejection of all claims is improper and must be reversed. An early indication of such is earnestly solicited.

Respectfully submitted,
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Dated: 9/29/03

CLAIMS APPENDIX

7. A cooling assembly for an electromechanical device, the assembly comprising:

a housing having a wall portion;

a magnetic field member disposed within said housing and arranged adjacent said wall portion;

a shaft having windings located within said magnetic field member with an electrical current flowing through said windings coacting with said magnetic field member, wherein at least one of said magnetic field member and said windings produces heat; and

a helical cooling coil defining a fluid conduit arranged adjacent said magnetic field member for removing said heat, wherein said wall portion is disposed between said coil and said windings with said coils secured to said wall portion with a mechanical fastening element.

9. The assembly according to claim 7, wherein rotation of said shaft produces a current in said magnetic field member.

10. A method of cooling generator comprising the steps of:

a) producing heat in the generator having a temperature;

b) pumping fluid through a helical coil arranged about a portion of the generator; and

c) absorbing the heat in the fluid to reduce the temperature.

13. The assembly according to claim 7, wherein said mechanical fastening element is a brazed joint connecting said coils to said wall.

Manufacturing Engineering and Technology

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ADDISON-WESLEY PUBLISHING COMPANY
Reading, Massachusetts • Menlo Park, California • New York
Don Mills, Ontario • Wokingham, England • Amsterdam • Bonn
Sydney • Singapore • Tokyo • Madrid • San Juan

Sponsoring Editor	Don Fowley
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Design, Editorial, and Production Services	Quadrata, Inc.
Illustrator	Capricorn Design
Cover Design	Marshall Henrichs
Manufacturing Supervisor	Hugh Crawford

Library of Congress Cataloging-in-Publication Data

Kalpakjian, Serope, 1928–
Manufacturing engineering and technology.

Bibliography: p.
Includes index.
1. Production engineering. 2. Manufacturing processes. I. Title.
TS176.K34 1989 670.42 88-24219
ISBN 0-201-12849-7

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We also describe adhesive bonding techniques. The ancient method of sticking parts with animal glue, as is done in labeling, packaging, and bookbinding, has now developed into an important technology with wide applications in the aerospace and various other industries, using a wide variety of adhesives.

All the joints that we have described so far are of a permanent nature. In many applications, there are situations where joined parts have to be taken apart for replacement, maintenance, repair, or adjustment. How do we take apart a product without destroying the joint? If we need joints that are truly nonpermanent—but are as strong as welded joints—the solution obviously is to use mechanical means, such as bolts, screws, nuts, and a variety of similar fasteners. Thus in this chapter, we also discuss the advantages and limitations of mechanical joining techniques. With this chapter, we conclude our description of all commonly used methods of joining processes.

30.2 Brazing

Brazing is a joining process in which a filler metal is placed at or between the faying surfaces to be joined, and the temperature is raised to melt the filler metal but not the workpieces (Fig. 30.1a). The molten metal fills the closely fitting space by capillary action. Upon cooling and solidification of the filler metal, a strong joint is obtained. Brazing comes from the word *brass*, an archaic word meaning to harden, and was first used as far back as 3000–2000 B.C. Actually, there are two types of brazing processes: (a) that which we have already described, and (b) braze welding (Fig. 30.1b), in which the filler metal is deposited at the joint with a technique similar to oxyfuel gas welding.

Filler metals used for brazing melt above 450 °C (840 °F). The temperatures employed in brazing are below the melting point (solidus temperature) of the metals to be joined. Thus this process is unlike liquid-state welding processes in which the

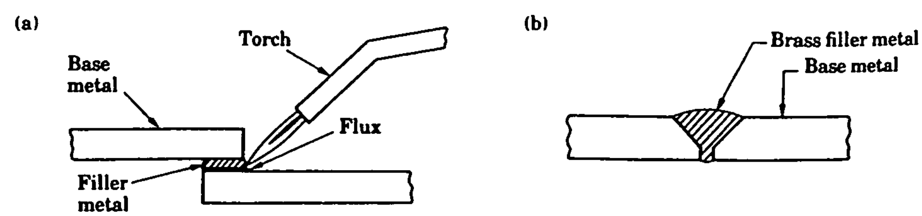

FIGURE 30.1
(a) Brazing and (b) braze welding operations.

Burnishing.

workpieces must melt in the weld area for fusion to occur. Problems associated with heat-affected zones, warping, and residual stresses (see Chapter 29) are therefore reduced in brazing.

The strength of the brazed joint depends on (a) joint design and (b) the adhesion at the interfaces of the workpiece and filler metal. Consequently, the surfaces to be brazed should be chemically or mechanically cleaned to ensure full capillary action; hence the use of a flux is important.

30.2.1 Filler metals

Several filler metals (*braze metals*) are available and have a range of brazing temperatures (Table 30.1). They come in a variety of shapes, such as wire, rings, shims, and filings. The choice of filler metal and its composition are important in order to avoid embrittlement of the joint (by grain boundary penetration of liquid metal), formation of brittle intermetallic compounds at the joint, and galvanic corrosion in the joint. Thus studying the relevant phase diagrams prior to the final selection of a filler metal for a particular application is essential. Note that filler metals for brazing, unlike other welding operations, generally have significantly different compositions than the metals to be joined.

Because of diffusion between the filler metal and the base metal, mechanical and metallurgical properties of joints can change in subsequent processing or during the service life of brazed components. For example, when titanium is brazed with pure tin filler metal, it is possible for the tin to completely diffuse into the titanium base metal by subsequent aging or heat treatment. When that happens, the joint no longer exists.

30.2.2 Fluxes

The use of a flux is essential in brazing in order to prevent oxidation and to remove oxide films from workpiece surfaces. Brazing fluxes are generally made of borax,

TABLE 30.1
TYPICAL FILLER METALS FOR BRAZING VARIOUS METALS AND ALLOYS

BASE METAL	FILLER METAL	BRAZING TEMPERATURE, (°C)
Aluminum and its alloys	Aluminum–silicon	570–620
Magnesium alloys	Magnesium–aluminum	580–625
Copper and its alloys	Copper–phosphorus	700–925
Ferrous and nonferrous (except aluminum and magnesium)	Silver and copper alloys, copper–phosphorus	620–1150
Iron-, nickel-, and cobalt-base alloys	Gold	900–1100
* Stainless steels, nickel- and cobalt-base alloys	Nickel–silver	925–1200

Burnishing

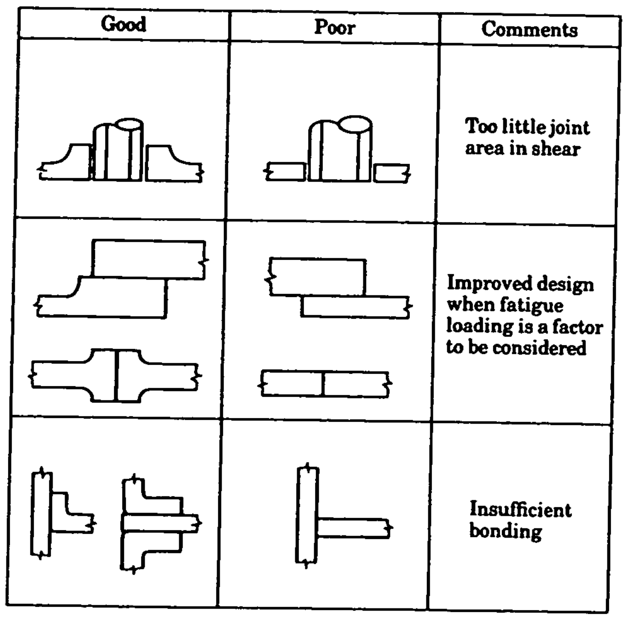

FIGURE 30.4
Examples of good and poor design for brazing. *Source:* American Welding Society.

30.3 Soldering

In soldering, the filler metal, called *solder*, melts below 450 °C (840 °F). As in brazing, the solder fills the joint by capillary action between closely fitting or closely placed components. Heat sources for soldering are usually soldering irons, torches, or ovens. Soldering with copper–gold and tin–lead alloys was first practiced as far back as 4000–3000 B.C.

There are several soldering methods, which are similar to brazing methods:

a) Torch soldering (TS).
b) Furnace soldering (FS).
c) Iron soldering (INS), using a soldering iron.
d) Induction soldering (IS).
e) Resistance soldering (RS).
f) Dip soldering (DS).
g) Infrared soldering (IRS).
h) Wave soldering (WS), used for automated soldering of printed circuit boards.

TABLE 30.2
TYPICAL SOLDERS AND THEIR APPLICATIONS

Tin–lead	General purpose
Tin–zinc	Aluminum
Lead–silver	Strength at higher than room temperature
Cadmium–silver	Strength at high temperatures
Zinc–aluminum	Aluminum; corrosion resistance

i) Ultrasonic soldering, in which a transducer subjects the molten solder to ultrasonic cavitation, which removes the oxide films from the surfaces to be joined. The need for a flux is thus eliminated.

30.3.1 Types of solders and fluxes

Solders (from the Latin *solidare*, meaning to make solid) are usually tin–lead alloys in various proportions. For better joint strength and special applications, other solder compositions that can be used are tin–zinc, lead–silver, cadmium–silver, and zinc–aluminum alloys (Table 30.2).

In soldering, fluxes are used as in welding and brazing and for the same purposes. Fluxes are generally of two types:

a) Inorganic acids or salts, such as zinc ammonium chloride solutions, which clean the surface rapidly. After soldering, the flux residues should be removed by washing thoroughly with water to avoid corrosion.
b) Noncorrosive resin-based fluxes, used in electrical applications.

30.3.2 Process capabilities

Soldering is used extensively in the electronics industry and in making containers for liquid- or air-tight joints (lock-seam cans; Fig. 30.5). Unlike brazing, soldering temperatures are relatively low. Thus a soldered joint has very limited use at elevated temperatures. Moreover, because solders do not generally have much strength, they are not used for load-bearing structural members. Because of the small faying surfaces, butt joints are rarely made with solders. In other situations, joint strength is improved by mechanical interlocking of the joint.

Copper and precious metals, such as silver and gold, are easy to solder, as is tinplate for food containers. Aluminum and stainless steels are difficult to solder because of their strong, thin oxide film (see Section 31.2). However, these and other metals can be soldered using special fluxes that modify surfaces.

Soldering can be used to join various metals and thicknesses. Although manual operations require skill and are time-consuming, soldering speeds can be high with automated equipment. The cost of soldering equipment depends on its complexity and the level of automation. It ranges from less than $100 for industrial soldering irons to more than $50,000 for automated equipment.